



IN THE MATTER OF
PATENT APPLICATION

C E R T I F I C A T E

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[Name of the Document] SPECIFICATION

[Title of the Invention] DISC, DISC CARTRIDGE, AND DISC DRIVE

[Claims]

[Claim 1] A disc including a signal recording layer between a first substrate and a second substrate, wherein signal recording or reproduction is performed from the side of the second substrate, and the first substrate has a thickness of 0.5 mm or greater.

[Claim 2] A disc according to claim 1, wherein the first substrate has an embossed design including concave and convex portions on a surface thereof.

[Claim 3] A disc according to claim 1, wherein the first substrate includes a first layer having an embossed design including concave and convex portions on a surface thereof and a second layer for covering the concave and convex surface of the first layer, and the second layer is provided on the side of an outer surface of the first substrate.

[Claim 4] A disc according to claim 2 or 3, wherein the embossed design including the concave and convex portions provided on the first layer of the first substrate has a level difference between the top and the bottom in the range of 0.2 mm to 1.0 mm.

[Claim 5] A disc according to claim 2 or 3, wherein the embossed design including the concave and convex portions

provided on the first layer of the first substrate is related to a video, audio or another content recorded on the signal recording layer.

[Claim 6] A disc according to claim 1, wherein the first substrate includes a first layer as a carrier and a film-like second layer provided on a surface of the first layer, and the second layer can be easily scratch-marked by a coin or a fingernail or peeled off.

[Claim 7] A disc according to claim 6, wherein the second layer is provided at a plurality of positions on the surface of the first layer, and the scratch mark is made on a specific second layer during an inspection process to display inherent information on warping, eccentricity of center of mass or the like.

[Claim 8] A disc according to claim 6, wherein a mark showing a quiz answer, a lottery result, foretold future (fortune) or the like printed on the first layer appears by peeling off the second layer.

[Claim 9] A disc according to claim 1, wherein a hologram of a plurality of drawing patterns stacked with transparent plates provided inside a great number of fine grooves engraved on the side of an outer surface of the first substrate.

[Claim 10] A disc according to claim 9, wherein a three-dimensional image displayed by the hologram is related

to a visual, audio or another content recorded on the signal recording layer.

[Claim 11] A disc cartridge for accommodating a disc according to any one of claims 2 through 9 in a state where the disc is exposed on the side of the first substrate and is covered on the side of the second substrate.

[Claim 12] A disc cartridge according to claim 11, wherein a drawing pattern or a design made on the first substrate of the disc is the same as, continuous with, or related in another manner to, a drawing pattern or a design made on a portion of the cartridge which is adjacent to the first substrate of the disc.

[Claim 13] A disc cartridge according to claim 12, wherein the first substrate of the disc has an embossed design including concave and convex portions, and a cartridge body has an embossed design including concave and convex portions, which is related to, or continuous with, the concave and convex design of the disc.

[Claim 14] A disc cartridge according to claim 13, wherein the embossed design including the concave and convex portions made on the first substrate of the disc has substantially the same level difference as that of the embossed design including the concave and convex portions made on the cartridge body.

[Claim 15] A disc cartridge according to claim 12, wherein the first substrate of the disc has a drawing pattern, and a cartridge body has a drawing pattern related to, or continuous with, the drawing pattern on the disc.

[Claim 16] A disc cartridge according to claim 12, wherein the first substrate of the disc is textured (delustered)-printed, and a cartridge body is textured (delustered)-printed of substantially the same design as the disc.

[Claim 17] A disc cartridge according to claim 11, wherein a tablet for allowing a desired trace to be made by a touch pen is provided on the side of an outer surface of first substrate.

[Claim 18] A disc cartridge according to claim 17, wherein the tablet encapsulates a magnetic body and is a magnetic tablet for allowing a desired trace to be made by a magnet or a magnetic touch pen.

[Claim 19] A disc cartridge according to claim 18, wherein the tablet includes a honeycomb-like group of small rooms filled with a viscous fluid and a magnetic powder, and the magnetic powder is attracted toward the outer surface of the tablet by being approached by the magnet attached to a tip of the touch pen so as to perform display.

[Claim 20] A disc cartridge according to claim 19, wherein a lengthy magnetic plate is provided so as to face

the second substrate of the disc, and the disc and the magnetic plate are relatively rotated around the disc as the center to separate the magnetic powder from the outer surface and thus to erase a character or a graphical pattern displayed on the tablet.

[Claim 21] A disc cartridge according to claim 17, wherein the tablet is an electromagnetic-coupled input device having a magnetic body or a conductive body incorporated therein.

[Claim 22] A disc cartridge according to claim 21, wherein the tablet includes a transparent tablet on a matrix-addressed display device such as a liquid crystal display device; and allows an input by being touched or pressed by a touch pen, or also displays the input information by the matrix-addressed display device at a position which is the same as, or corresponding to, that of the touch pen, and thus allows a desired character or graphical pattern to be drawn.

[Claim 23] A disc cartridge according to claim 21, which includes a memory for storing information input from the tablet and a power supply for supplying power to the tablet on the side of the cartridge body.

[Claim 24] A disc cartridge according to claim 11, wherein a matrix-addressed display device such as a liquid crystal or organic EL display device is provided on the side of an outer surface of the first substrate of the disc, and a

memory for providing the display device with information on an image to be displayed and a power supply for supplying power to the display device are provided on the side of a cartridge body.

[Claim 25] A disc cartridge according to claim 24, wherein the image displayed by the display device is related to a video, audio or another content recorded on a signal recording layer.

[Claim 26] A disc cartridge according to claim 11, wherein a planar speaker is provided on the side of an outer surface of the first substrate of the disc, and a memory for providing the speaker with information on audio data and a power supply for supplying power to the speaker are provided on the side of a cartridge body.

[Claim 27] A disc cartridge according to claim 26, wherein the cartridge body has a microphone for recording the audio data on the memory.

[Claim 28] A disc cartridge according to claim 26, wherein the audio data which is output by the speaker is related to a video, audio or another content recorded on a signal recording layer.

[Claim 29] A disc cartridge according to claim 11, wherein a cartridge body includes a speaker, a memory for providing the speaker with information on audio data, and a power supply for supplying power to the speaker, and the

speaker outputs audio data relating to the design, display or description on the substrate of the disc.

[Claim 30] A disc cartridge according to claim 11, wherein a pressure-sensitive layer changed in color or concentration by a contact pressure is provided on the side of the first substrate of the disc; a gap having a thickness of GA is provided between the second substrate of the disc and a bottom surface of the cartridge in at least a recording/reproduction area of the disc; and when the disc is pressed from the side of the first substrate and the amount of flexure reaches a value close to GA, the color of the pressure-sensitive layer is changed.

[Claim 31] A disc cartridge according to any one of claims 23 through 29, which has a disc-side terminal at an outer periphery of the disc and a body-side terminal on the side of a cartridge body; and when the disc contacts and is held by the cartridge body, the disc-side terminal and the body-side terminal contact each other to be electrically conductive to each other.

[Claim 32] A disc cartridge according to claim 31, wherein a plurality of disc-side terminals are provided on an outer edge surface of the disc in a thickness direction of the disc.

[Claim 33] A disc cartridge according to claim 31, wherein a plurality of ring-like disc-side terminals are concentrically provided at the outer periphery of the disc.

[Claim 34] A disc cartridge according to claim 31, wherein a plurality ring-like body-side terminals are provided concentrically with respect to the center of the disc.

[Claim 35] A disc cartridge according to claim 31, wherein the surface of the first substrate of the disc and a surface of the cartridge body are marked so as to indicate that the position of the disc-shape terminal matches the position of the body-side terminal when the exposed disc is manually rotated with respect to the cartridge body.

[Claim 36] A disc cartridge according to any one of claims 23 through 29, which has a disc-side terminal in an upper layer of the first substrate of the disc and a body-side terminal on an upper surface of a cartridge body, and the disc-side terminal and the body-side terminal become electrically conductive to each other by being touched at the same time by a hand or a finger.

[Claim 37] A disc drive controlled to load a disc cartridge according to any one of claims 12 through 16, 31 and 32, and to, after recording/reproduction is performed on a disc accommodated in the disc cartridge, cause the disc to

be accommodated in the disc cartridge at the same angular position as that before the recording/reproduction.

[Claim 38] A disc drive controlled to load a disc cartridge according to any one of claims 12 through 16, 31 and 32, and to, after recording/reproduction is performed on a disc accommodated in the disc cartridge, return the disc to the disc cartridge at the same angular position as that before the recording/reproduction.

[Detailed Description of the Invention]

[0001]

[Field of the Invention]

The present invention relates to a disc as a disc-type signal recording medium such as an optical disc, a magnetic disc or the like, a cartridge for accommodating such a disc in a rotatable state, and a disc drive for loading such a cartridge and performing recording to, or reproduction from, the disc.

[0002]

[Prior Art]

In a conventional optical disc represented by a CD, a substrate for protecting a recording/reproduction surface of a signal recording layer is structured to have a large thickness of 1.2 mm, and a substrate for protecting a rear surface of the signal recording layer is structured to have a small thickness of 0.1 mm or less. Therefore, in the

conventional optical disc, the design on the rear surface, i.e., the label-side surface is limited to coatings on the disc in different manners or the like. By contrast, a large-capacity optical disc such as a recently available DVD, a substrate on the recording/reproduction side has a structured to have a small thickness of 0.6 mm in order to increase the aperture (NA) for a recording/reproduction light ray while reducing the influence by the inclination of the disc, and a substrate on the rear side is structured to have a large thickness of 0.6 mm. As optical discs have a higher density in the future, the substrate on the recording/reproduction side is expected to be thinner and the substrate on the rear side is expected to be thicker.

[0003]

A disc cartridge represented by an MD or a DVD-RAM has a structure of accommodating the entire disc inside, and the disc is not visible from outside. Therefore, the design which can be made on the disc or the cartridge is limited.

[0004]

A list of disc contents or the like is written on a label pasted on the cartridge body. Therefore, once the disc is removed from the cartridge or replaced with another disc, the label becomes invalid, which is inconvenient to use.

[0005]

[Problems to be Solved by the Invention]

The present invention has an object of solving the above-described problems, and providing new visual and tactual effects on a disc such as a DVD realized in the future by an increased thickness of the label-side substrate and new visual, tactual and audio effects and convenience in use realized by a cartridge exposing the label-side surface of such a disc and a disc drive for loading the cartridge.

[0006]

[Means for Solving the Problems]

A disc according to the present invention includes a signal recording layer between a first substrate and a second substrate, wherein signal recording or reproduction is performed from the side of the second substrate, and the first substrate has a thickness of 0.5 mm or greater.

[0007]

In one preferred embodiment, the first substrate has an embossed design including concave and convex portions on a surface thereof.

[0008]

In one preferred embodiment, the first substrate includes a first layer having an embossed design including concave and convex portions on a surface thereof and a second layer for covering the concave and convex surface of the first layer, and the second layer is provided on the side of an outer surface of the first substrate.

[0009]

In one preferred embodiment, the embossed design including the concave and convex portions provided on the first layer of the first substrate has a level difference between the top and the bottom in the range of 0.2 mm to 1.0 mm.

[0010]

In one preferred embodiment, the embossed design including the concave and convex portions provided on the first layer of the first substrate is related to a video, audio or another content recorded on the signal recording layer.

[0011]

In one preferred embodiment, the first substrate includes a first layer as a carrier and a film-like second layer provided on a surface of the first layer, and the second layer can be easily scratch-marked by a coin or a fingernail or peeled off.

[0012]

In one preferred embodiment, the second layer is provided at a plurality of positions on the surface of the first layer, and the scratch mark is made on a specific second layer during an inspection process to display inherent information on warping, eccentricity of center of mass or the like.

[0013]

In one preferred embodiment, a mark showing a quiz answer, a lottery result, foretold future (fortune) or the like printed on the first layer appears by peeling off the second layer.

[0014]

In one preferred embodiment, a hologram of a plurality of drawing patterns stacked with transparent plates provided inside a great number of fine grooves engraved on the side of an outer surface of the first substrate.

[0015]

In one preferred embodiment, a three-dimensional image displayed by the hologram is related to a visual, audio or another content recorded on the signal recording layer.

[0016]

A disc cartridge according to the present invention accommodates any of the above-described discs in a state where the disc is exposed on the side of the first substrate and is covered on the side of the second substrate.

[0017]

In one preferred embodiment, a drawing pattern or a design made on the first substrate of the disc is the same as, continuous with, or related in another manner to, a drawing pattern or a design made on a portion of the

cartridge which is adjacent to the first substrate of the disc.

[0018]

In one preferred embodiment, the first substrate of the disc has an embossed design including concave and convex portions, and a cartridge body has an embossed design including concave and convex portions, which is related to, or continuous with, the concave and convex design of the disc.

[0019]

In one preferred embodiment, the embossed design including the concave and convex portions made on the first substrate of the disc has substantially the same level difference as that of the embossed design including the concave and convex portions made on the cartridge body.

[0020]

In one preferred embodiment, the first substrate of the disc has a drawing pattern, and a cartridge body has a drawing pattern related to, or continuous with, the drawing pattern on the disc.

[0021]

In one preferred embodiment, the first substrate of the disc is textured (delustered)-printed, and a cartridge body is textured (delustered)-printed of substantially the same design as the disc.

[0022]

In one preferred embodiment, a tablet for allowing a desired trace to be made by a touch pen is provided on the side of an outer surface of first substrate.

[0023]

In one preferred embodiment, the tablet encapsulates a magnetic body and is a magnetic tablet for allowing a desired trace to be made by a magnet or a magnetic touch pen.

[0024]

In one preferred embodiment, the tablet includes a honeycomb-like group of small rooms filled with a viscous fluid and a magnetic powder, and the magnetic powder is attracted toward the outer surface of the tablet by being approached by the magnet attached to a tip of the touch pen so as to perform display.

[0025]

In one preferred embodiment, a lengthy magnetic plate is provided so as to face the second substrate of the disc, and the disc and the magnetic plate are relatively rotated around the disc as the center to separate the magnetic powder from the outer surface and thus to erase a character or a graphical pattern displayed on the tablet.

[0026]

In one preferred embodiment, the tablet is an electromagnetic-coupled input device having a magnetic body or a conductive body incorporated therein.

[0027]

In one preferred embodiment, the tablet includes a transparent tablet on a matrix-addressed display device such as a liquid crystal display device; and allows an input by being touched or pressed by a touch pen, or also displays the input information by the matrix-addressed display device at a position which is the same as, or corresponding to, that of the touch pen, and thus allows a desired character or graphical pattern to be drawn.

[0028]

In one preferred embodiment, the disc cartridge includes a memory for storing information input from the tablet and a power supply for supplying power to the tablet on the side of the cartridge body.

[0029]

In one preferred embodiment, a matrix-addressed display device such as a liquid crystal or organic EL display device is provided on the side of an outer surface of the first substrate of the disc, and a memory for providing the display device with information on an image to be displayed and a power supply for supplying power to the display device are provided on the side of a cartridge body.

[0030]

In one preferred embodiment, the image displayed by the display device is related to a video, audio or another content recorded on a signal recording layer.

[0031]

In one preferred embodiment, a planar speaker is provided on the side of an outer surface of the first substrate of the disc, and a memory for providing the speaker with information on audio data and a power supply for supplying power to the speaker are provided on the side of a cartridge body.

[0032]

In one preferred embodiment, the cartridge body has a microphone for recording the audio data on the memory.

[0033]

In one preferred embodiment, the audio data which is output by the speaker is related to a video, audio or another content recorded on a signal recording layer.

[0034]

In one preferred embodiment, a cartridge body includes a speaker, a memory for providing the speaker with information on audio data, and a power supply for supplying power to the speaker, and the speaker outputs audio data relating to the design, display or description on the substrate of the disc.

[0035]

In one preferred embodiment, a pressure-sensitive layer changed in color or concentration by a contact pressure is provided on the side of the first substrate of the disc; a gap having a thickness of GA is provided between the second substrate of the disc and a bottom surface of the cartridge in at least a recording/reproduction area of the disc; and when the disc is pressed from the side of the first substrate and the amount of flexure reaches a value close to GA, the color of the pressure-sensitive layer is changed.

[0036]

In one preferred embodiment, the disc cartridge has a disc-side terminal at an outer periphery of the disc and a body-side terminal on the side of a cartridge body; and when the disc contacts and is held by the cartridge body, the disc-side terminal and the body-side terminal contact each other to be electrically conductive to each other.

[0037]

In one preferred embodiment, a plurality of disc-side terminals are provided on an outer edge surface of the disc in a thickness direction of the disc.

[0038]

In one preferred embodiment, a plurality of ring-like disc-side terminals are concentrically provided at the outer periphery of the disc.

[0039]

In one preferred embodiment, a plurality ring-like body-side terminals are provided concentrically with respect to the center of the disc.

[0040]

In one preferred embodiment, the surface of the first substrate of the disc and a surface of the cartridge body are marked so as to indicate that the position of the disc-shape terminal matches the position of the body-side terminal when the exposed disc is manually rotated with respect to the cartridge body.

[0041]

In one preferred embodiment, the disc cartridge has a disc-side terminal in an upper layer of the first substrate of the disc and a body-side terminal on an upper surface of a cartridge body, and the disc-side terminal and the body-side terminal become electrically conductive to each other by being touched at the same time by a hand or a finger.

[0042]

A disc drive according to the present invention is controlled to load the above-described disc cartridge and to, after recording/reproduction is performed on a disc accommodated in the disc cartridge, cause the disc to be accommodated in the disc cartridge at the same angular position as that before the recording/reproduction.

[0043]

In one preferred embodiment, the disc drive is controlled to load the above-described disc cartridge, and to, after recording/reproduction is performed on a disc accommodated in the disc cartridge, return the disc to the disc cartridge at the same angular position as that before the recording/reproduction.

[0044]

[Embodiments of the Invention]

(EMBODIMENT 1)

Hereinafter, a disc **10**, a disc cartridge **100**, and a disc drive **180** according to a first embodiment of the present invention will be described with reference to the figures.

[0045]

FIG. **1** is an external perspective view of the disc cartridge accommodating the disc **10**, and FIG. **2** is a cross-sectional view of the disc cartridge in FIG. **1** showing a structure in a thickness direction thereof.

[0046]

In FIGS. **1** and **2**, **1** is a signal recording layer, **2** is a first substrate, and **3** is a second substrate. The signal recording layer **1** is sandwiched between the first substrate **11** and the second substrate **12**, and recording to, or reproduction from, the signal recording layer **1** is performed from the side of the second substrate **2**. The disc **10** includes the signal recording layer **1**, the second substrate **2**

and the first substrate **11**. The first substrate **11** has a thickness of 0.5 mm or greater, and includes a first layer **13** having an embossed design **13a** including concave and convex portions on a surface thereof and a transparent second layer **12** for covering a surface of the first layer **13**. The level difference in the embossed design **13a** between the top and the bottom of the concave and convex portions is in the range of 0.2 mm to 1.0 mm. A cartridge body **110** includes a body part **113** having a concave and convex design **113a** on a surface thereof and a transparent part **112** for covering the surface of the body part **113**. The disc **10** is held and accommodated in a recessed portion **110d** of the cartridge body **110** in the state where the first substrate **11** is exposed. The drawing pattern of the of the concave and convex design **13a** made on the disc **10** and the concave and convex design **113a** made on the cartridge body **110** are continuous to each other as shown in FIG. 1. The design may be related with contents such as movies or dramas recorded on the signal recording layer **1** of the disc **10**.

[0047]

The disc drive **180** using the disc cartridge **100** in first embodiment will be described with reference to FIG. 3.

[0048]

FIG. 3 is a thickness-direction cross-sectional view showing a state where the disc cartridge **100** is loaded on the

disc drive 180. In FIG. 3, 182 is a spindle motor entering from a window 110w provided in a lower surface of the cartridge body 110 for holding and securing the disc 10 while rotating the disc 10. 181 is an optical pickup entering from the window 110w for recording a signal to, or reproducing a signal from, the rotating disc 10. 184 is a motor rotational angle detector for receiving a signal from a sensor (not shown) built in the spindle motor 182 and detecting the rotational angle position of the spindle motor 182.

[0049]

When the disc cartridge 100 is loaded on the disc drive 180 and the disc 10 is held by the spindle motor 182, the rotational angle position of the spindle motor 182 at that point is detected by the motor rotational angle detector 184. When the recording operation to, or reproduction operation from, with respect to the disc 10 by the optical pickup 181 is completed, the spindle motor 182 stops at the same rotational angle position as the position where the disc 10 was first held, returns the disc 10 to the cartridge body 110, and unloads the disc 10 outside the disc drive 180. Accordingly, the rotational angle position of the disc 10 on the disc cartridge 110 is the same before and after the disc cartridge 100 is inserted into the disc drive 180. The aesthetic problem and inconvenience in use that the rotational angle position of the disc 10 with respect to the

disc cartridge body **110** is randomly changed each time the disc cartridge **100** is inserted into, and removed from, the disc drive **180** is eliminated.

[0050]

A disc drive **190** using the disc cartridge **100** according to the first embodiment will be described with reference to FIG. **4**.

[0051]

FIG. **4** shows a thickness-direction cross-sectional view showing a state where the disc cartridge **100** is loaded on the disc drive **190**. In FIG. **4**, **14** is an angle mark made on an outer surface of the disc **10**, and **194** is a disc angle detector provided in the disc drive **190**. When the recording operation to, or reproduction operation from, the disc **10** by the optical pickup **191** is completed, the spindle motor **192** stops at the rotational angle position at which the disc angle detector **194** detected the angle mark **14**, returns the disc **10** to the cartridge body **110**, and unloads the disc **10** outside the disc drive **190**. Accordingly, the rotational angle position of the disc **10** on the disc cartridge **110** is the same as the position before the disc cartridge **100** is inserted into the disc drive **190**. The aesthetic problem and inconvenience in use that the rotational angle position of the disc **10** with respect to the disc cartridge body **110** is

randomly changed each time the disc cartridge **100** is inserted into, and removed from, the disc drive **190** is eliminated.

[0052]

As described above, the disc **10**, the disc drive **180** and the disc drive **190** in the first embodiment can provide a new visual effect on the disc realized by an increased thickness of the first substrate (label-side substrate) as compared to that of the conventional CD.

[0053]

The disc cartridge **100** in the first embodiment allows the design on the label-side surface of the disc, which was conventionally not visible from outside, to be visible in association with the design on the cartridge body, and thus can provide a new visual effect and a commercial value.

[0054]

The surface of the concave and convex design on the first substrate of the disc is described as being covered by the transparent second layer so that the disc surface is flat. In the case where the transparent second layer is not provided and the concave and convex portions are exposed to the surface of the disc, a new tactual effect can be provided in addition to the visual effect.

[0055]

The first substrate of the disc is described as having the concave and convex design. The first substrate may

include a first layer as a carrier and a film-like second layer provided on the surface of the first layer, so that that the second layer can be easily scratch-marked by a coin or a fingernail or can be peeled off. Alternatively, a plurality of second layers may be provided on a surface of the first layer, so that a specific second layer can be scratch-marked during an inspection process to display inherent information such as warping, eccentricity of center of mass, or the like. Still alternatively, the first substrate may be structured such that when the second layer is peeled off, a mark showing a quiz answer, a lottery result, or foretold future (fortune) or the like printed on the surface of the first layer appears. In such cases, substantially the same effect can be provided. A hologram of a plurality of drawing patterns stacked with transparent plates provided inside a great number of fine grooves engraved on the surface the first substrate may be provided. In this case also, substantially the same effect can be provided.

[0056]

The first substrate of the disc and the disc cartridge body are described as having a concave and convex design. Alternatively, a drawing pattern by usual printing or a design by textured printing may be used. Substantially the same effect can be provided as the disc cartridge.

[0057]

(EMBODIMENT 2)

Next, a disc **20** and a disc cartridge **200** according to a second embodiment of the present invention will be described with reference to the figures.

[0058]

FIG. **5** is an external perspective view of the disc cartridge **200** accommodating the disc **20**, and FIG. **6** is a cross-sectional view of the disc cartridge in FIG. **5** showing a structure in a thickness direction thereof.

[0059]

In FIGS. **5** and **6**, identical elements as those in the first embodiment bear identical reference numerals thereto and descriptions thereof will be omitted. A first substrate **21** of the disc **20** includes a carrier **23** and a tablet **22** provided on an outer surface thereof. The tablet **22** includes a honeycomb-like group of small rooms **24** encapsulating a viscous fluid **25** and a magnetic powder **26** and a transparent sheet **27** for covering an upper surface of the group of small rooms **24**. The disc **20** is held and accommodated in a recessed portion **210b** of a cartridge body **210** in the state that the first substrate **21** is exposed. On the bottom of the recessed portion **210d** of the cartridge body **210**, a lengthy magnetic plate **211** is located so as to face the second substrate **2** of the disc **20**.

[0060]

When the user brings a touch pen **220**, having a magnet **211** buried at a tip thereof, into contact with a surface of the table **22**, the magnetic powder **26** in the small rooms **24** are attracted upward. As the touch pen **24** moves, characters and graphical patterns are displayed through the transparent sheet **27**. As shown in FIG. 5, when the user rotates the disc **20** once with respect to the disc cartridge body **210** around the disc as the center as, for example, represented with arrow **20A**, the magnetic powder **26** can be separated from the outer surface and thus the characters and graphical patterns displayed on the tablet **22** can be erased.

[0061]

As described above, the disc cartridge **200** in the second embodiment allows the list of disc contents or the like, which is conventionally written in a limited area of the label sheet pasted on the cartridge body, to be directly written on the disc accommodated in the cartridge in a large area, and also allows the list or the like to be easily erased. Therefore, the convenience in use is improved, and the trouble of rewriting the list after the disc is removed from the cartridge is eliminated.

[0062]

The characters and graphical patterns are described as being merely displayed with a touch pen. A transparent

coordinate input sheet may be provided on the tablet so that characters and graphical patterns can be input as coordinate data. In this case also, substantially the same effect can be provided.

[0063]

(EMBODIMENT 3)

Next, a disc 30 and a disc cartridge 300 according to a third embodiment of the present invention will be described with reference to a figure.

[0064]

FIG. 7 is a partially-cut external perspective view of the disc cartridge 300 accommodating the disc 30.

[0065]

In FIG. 7, identical elements as those in the first embodiment bear identical reference numerals thereto and descriptions thereof will be omitted. A matrix-addressed display device 32 of, for example, organic EL or liquid crystal material is included on the side of an outer surface of the disc 30. The disc 30 is held and accommodated in a recessed portion 310d of a cartridge body 310 in the state where the matrix-addressed display device 32 is exposed. The cartridge body 310 accommodates a speaker 313, a control section 311 for enabling the matrix-addressed display device 32 to display, a memory 312 for providing information on a moving image to be displayed or a sound for the speaker 313,

and a power supply **314** for supplying power to these components. A disc holding section **315** for pressing the disc **30** toward the bottom of the recessed portion **310d** of the cartridge body **310** to hold and secure the disc **30** is provided so as to extend onto an upper surface of the disc **30**. On a surface of the disc holding section **315** facing the disc **30**, body-side terminals **316a** and **316b** connected to the control section **311** are located. On the upper surface of the disc **30** facing the body-side terminals **316a** and **316b**, disc-side terminals **36a** and **36b** connected to the matrix-addressed display device **32** are located. In the state where the disc cartridge **300** is removed from the disc drive and is present independently, the disc holding section **315** is usually pressed on the upper surface of the disc **30**. The body-side terminal **316a** is in contact with the disc-side terminal **36a** to be electrically conductive thereto, and the body-side terminal **316b** is in contact with the disc-side terminal **36b** to be electrically conductive thereto. At this point, the moving image displayed on the matrix-addressed display device **32** or the sound output from the speaker **313** may be related to the contents such as a movie or drama recorded on the disc **30**.

[0066]

When wishing to display an image on the matrix-addressed display device **32**, the user can manually rotate the disc **30**

to align a disc-side mark **37** provided on the disc **30** with a body-side mark **317** provided on the cartridge body **310**. Thus, the body-side terminals **316a** and **316b** are put into contact with the disc-side terminals **36a** and **36b**. When wishing to erase the display, the user can manually rotate the disc **30** so that the disc **30** is held to be offset with respect to the cartridge body **310** in the rotation direction. Thus, the body-side terminals **316a** and **316b** are put out of contact with the disc-side terminals **36a** and **36b**.

[0067]

As described above, the disc cartridge **300** in the third embodiment allows a moving picture to be displayed on the label-side surface of the disc, and thus can entertain the user in a variety of ways, and also provide the customers with more information on the contents when exhibited in the store. Thus, the commercial value can be improved.

[0068]

The memory **312** is described as being built in, but substantially the same effect can be provided with an individual replaceable memory.

[0069]

A transparent coordinate input sheet may be provided on the surface of the matrix-addressed display device **32** so as to input characters and graphical patterns to the memory as

coordinate data. In this case, substantially the same effect can be provided.

[0070]

(EMBODIMENT 4)

Next, a disc **40** and a disc cartridge **400** according to a fourth embodiment of the present invention will be described with reference to the figures.

[0071]

FIG. **8** is a partially-cut external perspective view of the disc cartridge **400** accommodating the disc **40**.

[0072]

In FIG. **8**, identical elements as those in the first embodiment bear identical reference numerals thereto and descriptions thereof will be omitted. A planar speaker **42** is included on the side of an outer surface of the disc **40**. The disc **40** is held and accommodated in a recessed portion **410d** of a cartridge body **410** in the state where the planar speaker **42** is exposed. The cartridge body **410** accommodates a microphone **413**, a control section **411** for driving the planar speaker **42**, a memory **412** for providing information on audio data, a power supply **414** for supplying power to these components, and a switch **417** for allowing the user to turn on or off the supply of the power. A disc holding section **415** for pressing the disc **40** toward the bottom of the recessed portion **410d** of the cartridge body **410** to hold and secure the

disc **40** is provided so as to extend onto an upper surface of the disc **40**. On a surface of the disc holding section **415** facing the disc **40**, body-side terminals **416a** and **416b** connected to the control section **411** are located. On the upper surface of the disc **40** facing the body-side terminals **416a** and **416b**, ring-like disc-side terminals **46a** and **46b** connected to the planar speaker **42** are concentrically located. In the state where the disc cartridge **400** is removed from the disc drive and is present independently, the disc holding section **415** is usually pressed on the upper surface of the disc **40**. The body-side terminal **416a** is in contact with the disc-side terminal **46a**, and the body-side terminal **416b** is in contact with the disc-side terminal **46b**. The electricity can be turned on or off by the switch **417**. The sound which is output from the planar speaker **42** may be related to the contents such as a movie or drama recorded on the disc **40**, or may be a sound recorded by the microphone **413**.

[0073]

As described above, the disc-side terminals **46a** and **46b** are ring-like. Therefore, in whichever way the relative angular position of the disc **40** with respect to the cartridge body **410** may be changed by the disc cartridge **400** being loaded on the disc drive or by the user rotating the disc **40**, the disc-side terminals **46a** and **46b** necessarily face the

body-side terminals **146a** and **146b**. As long as the disc cartridge **400** is outside the disc drive, the disc-side terminals **46a** and **46b** are in contact with the body-side terminals **146a** and **146b**. Thus, the inconvenience in use that the disc **40** needs to be manually rotated with respect to the cartridge body **410** each time the disc cartridge **400** is removed is eliminated.

[0074]

The ring-like disc-side terminals **46a** and **46b** may each be shaped as one continuous circle with no discontinuity, or formed of a plurality of arcs with a short gap shorter than the length of the body-side terminals **146a** and **146b** in the tangential direction of the disc.

[0075]

As shown in FIG. 9, a land-like disc-side terminal **46c** may be provided in place of the ring-like disc-side terminal **46b**, and a land-like body-side terminal **416c** may be provided in place of the body-side terminal **416b** on an upper surface of the cartridge body **410**. In this case, the disc-side terminal **46c** and the body-side terminal **416c** can be electrically conductive to each other by the user touching both the terminals with a hand or a finger at the same time. Thus, the switch **417** can be eliminated.

[0076]

(EMBODIMENT 5)

Next, a disc **50** and a disc cartridge **500** according to a fifth embodiment of the present invention will be described with reference to a figure.

[0077]

FIG. **10** is a cross-sectional view of the disc cartridge **500** in which the disc **50** is accommodated in a cartridge body **510**, showing a structure thereof in a thickness direction.

[0078]

In FIG. **10**, identical elements as those in the first embodiment bear identical reference numerals thereto and descriptions thereof will be omitted. A first substrate **51** of the disc **50** includes a pressure-sensitive layer **52** on the side of an outer surface thereof, which is changed in color or concentration by a contact pressure. The disc **50** is held and accommodated in a recessed portion **510d** of a cartridge body **510** in the state where the pressure-sensitive layer **52** is exposed. There is a gap **550** having a thickness of **GA** between the second substrate **2** of the disc **50** and a bottom surface **510b** of the recessed portion **510d** of the cartridge body **510**, in a signal recording/reproduction area **1s** of the disc **50**.

[0079]

When the user presses the disc **50** from the side of the first substrate **51** and the amount of flexure reaches a value close to **GA** as represented with a dashed line **50'**, the color

of the pressure-sensitive layer 52 is changed, which alerts the user that the disc 50 may be scratched.

[0080]

[Effect of the Invention]

As described above, a disc, a disc cartridge and a disc drive according to the present invention can provide new visual and tactual effects on a disc realized by an increased thickness of the label-side substrate and new visual, tactual and audio effects and convenience in use realized by a cartridge exposing the label-side surface of such a disc and a disc drive for loading such a cartridge.

[Brief Description of the Drawings]

[FIG. 1]

FIG. 1 is an external perspective view of a disc cartridge according to the first embodiment of the present invention.

[FIG. 2]

FIG. 2 is a cross-sectional view of the disc cartridge in FIG. 1 showing a structure in a thickness direction thereof.

[FIG. 3]

FIG. 3 is a thickness-direction cross-sectional view showing a state where the disc cartridge in FIG. 1 is loaded on a disc drive.

[FIG. 4]

FIG. 4 is a thickness-direction cross-sectional view showing a state where the disc cartridge in FIG. 1 is loaded on another disc drive.

[FIG. 5]

FIG. 5 is an external perspective view of a disc cartridge according to the second embodiment of the present invention.

[FIG. 6]

FIG. 6 is a cross-sectional view of the disc cartridge in FIG. 5 showing a structure in a thickness direction thereof.

[FIG. 7]

FIG. 7 is a partially cut external perspective view of a disc cartridge according to the third embodiment of the present invention.

[FIG. 8]

FIG. 8 is a partially cut external perspective view of a disc cartridge according to the fourth embodiment of the present invention.

[FIG. 9]

FIG. 9 is an external perspective view showing an example in which the disc cartridge in FIG. 8 is provided with a different disc-side terminal and a different body-side terminal.

[FIG. 10]

FIG. 10 is a cross-sectional view of a disc cartridge in the fifth embodiment of the present invention showing a structure in a thickness direction thereof.

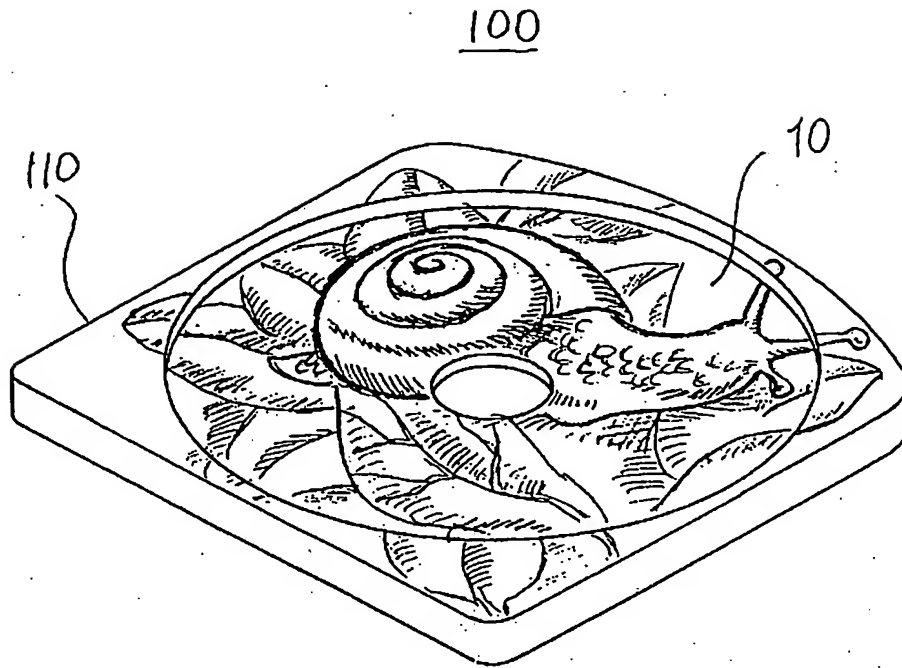
[Description of the Reference Numerals]

- 1 Signal recording layer
- 2 Second substrate
- 10, 20, 30, 40, 50 Disc
- 11, 21, 51 First substrate
- 12 Second layer
- 13 First layer
- 13a Concave and convex surface (disc)
- 100, 200, 300, 400, 500 Disc cartridge
- 110, 210, 310, 410, 510 Cartridge body
- 113a Concave and convex surface (cartridge body)
- 180, 190 Disc drive
- 184 Motor rotational angle detector
- 194 Disc angle detector
- 22 Tablet
- 24 Small room
- 25 Viscous fluid
- 26 Magnetic powder
- 27 Transparent sheet
- 220 Touch pen
- 221 Magnet
- 32 Matrix-addressed display device

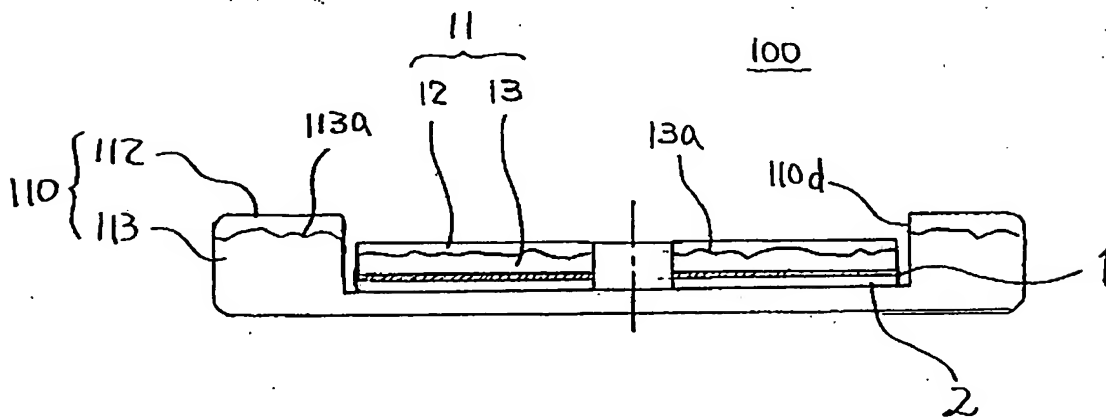
36a, 36b, 46a, 46b, 46c Disc-side terminal
37 Mark
312, 412 Memory
313 Speaker
314 Power supply
316a, 316b, 416a, 416b, 416c Body-side terminal
317 Mark
42 Planar speaker
413 Microphone
52 Pressure-sensitive layer
550 Gap having a thickness of GA

[Name of Document] Drawings

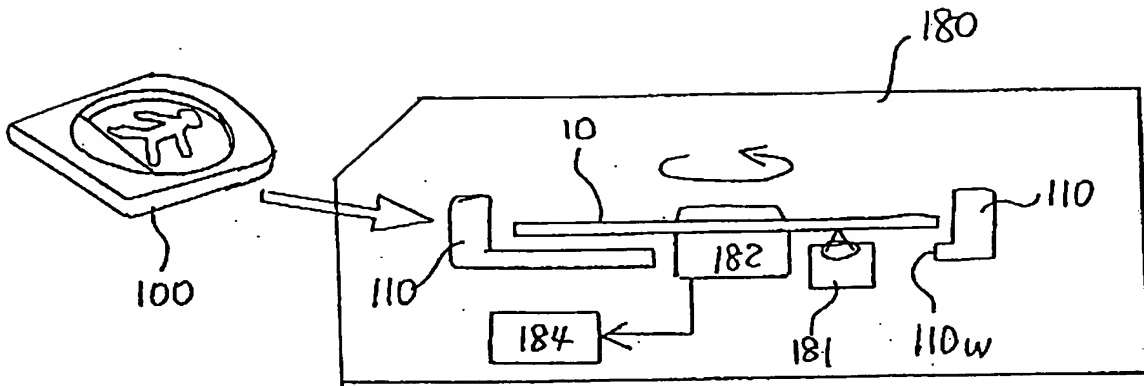
[Fig.1]



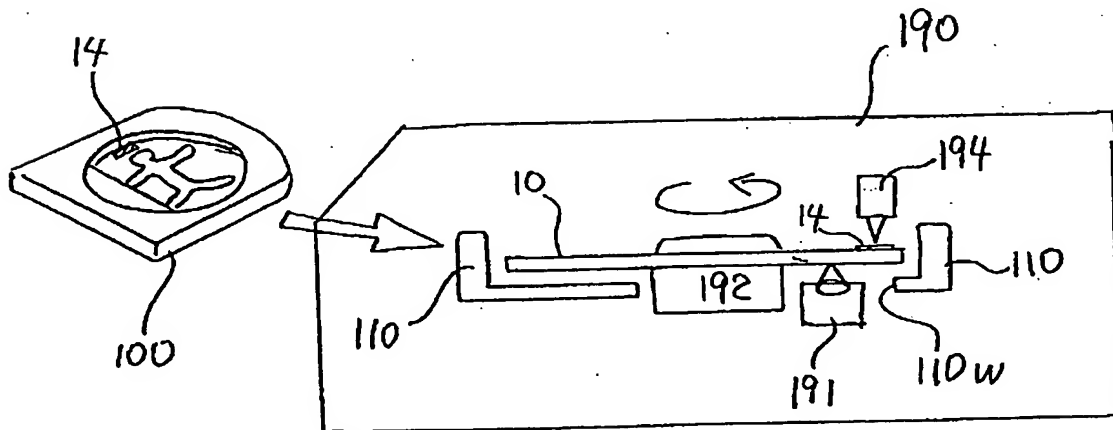
[Fig.2]



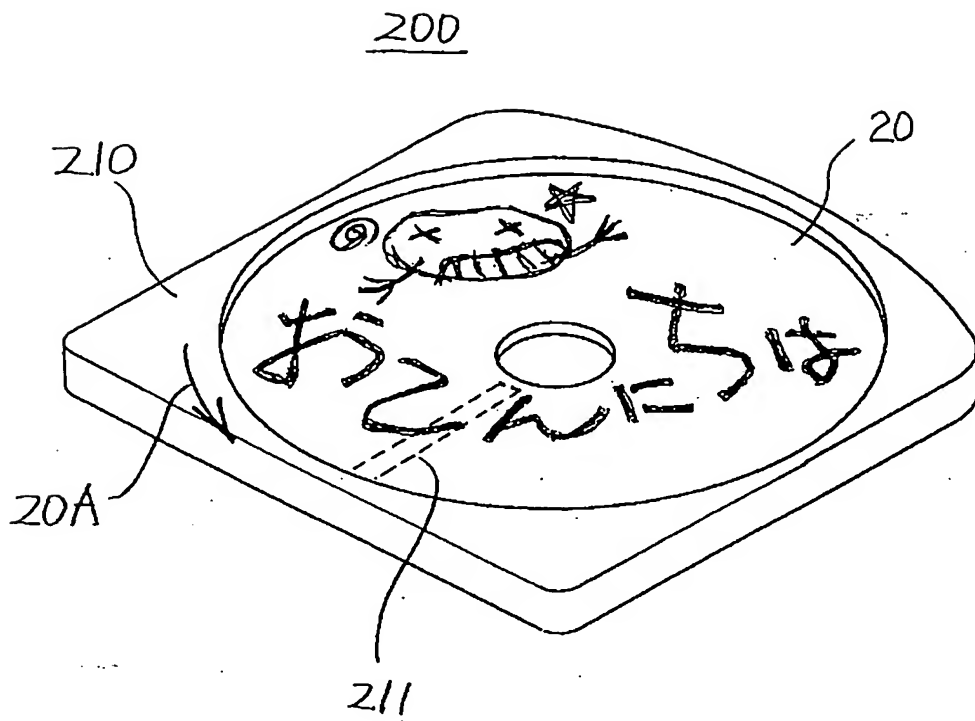
[Fig. 3]



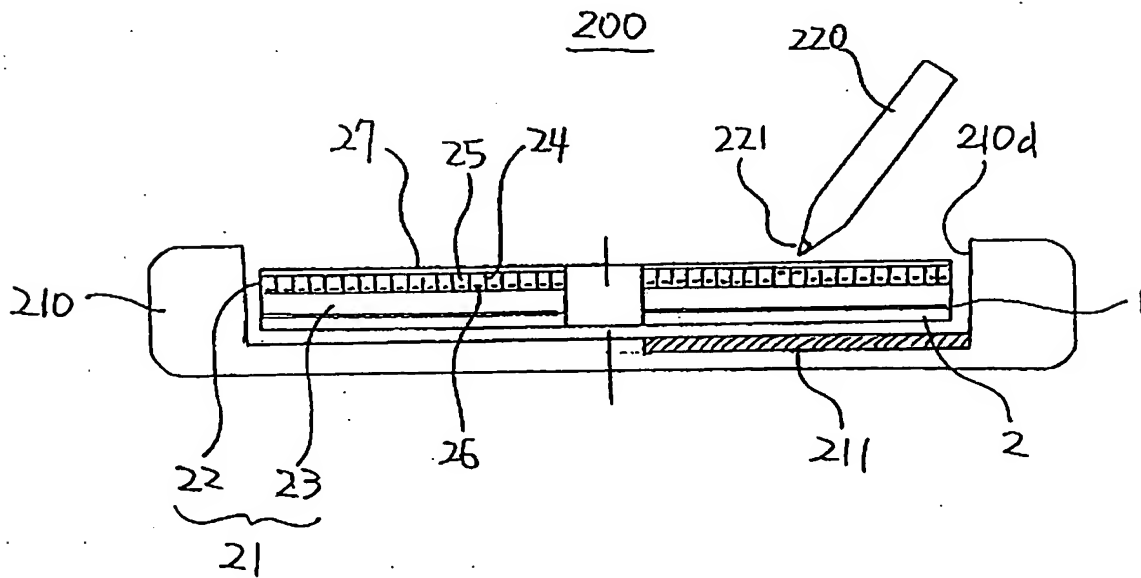
[Fig. 4]



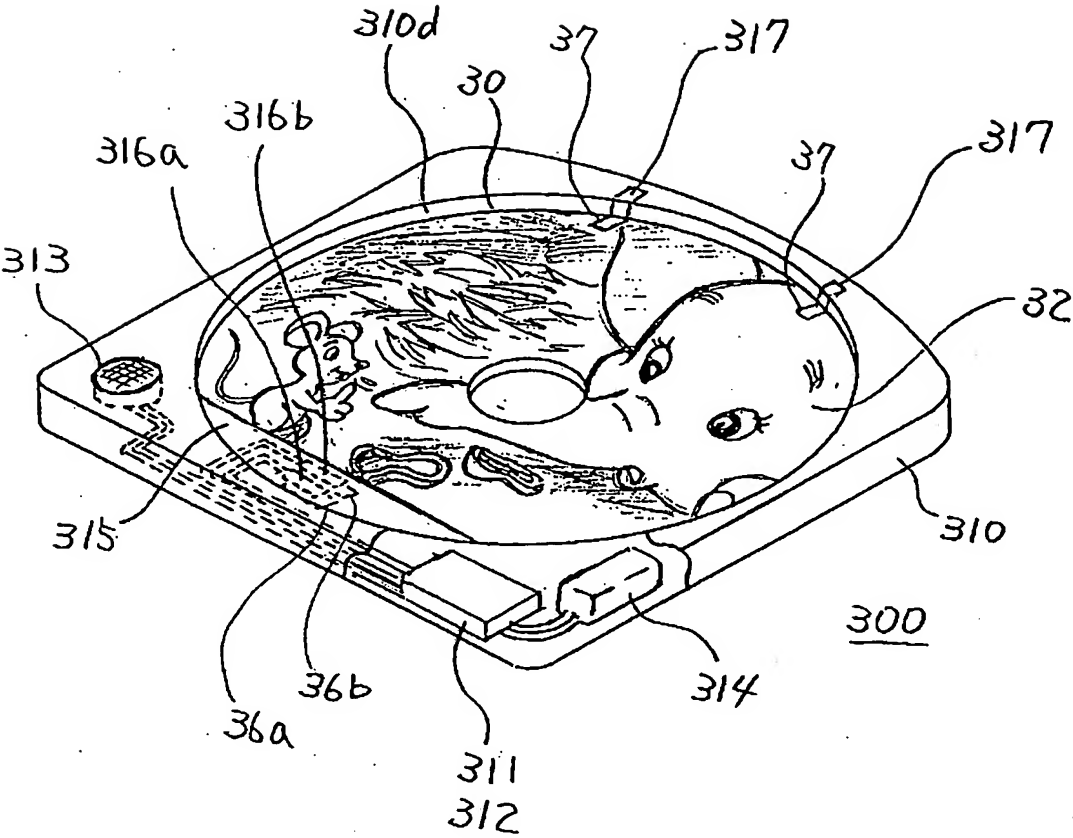
[Fig. 5]



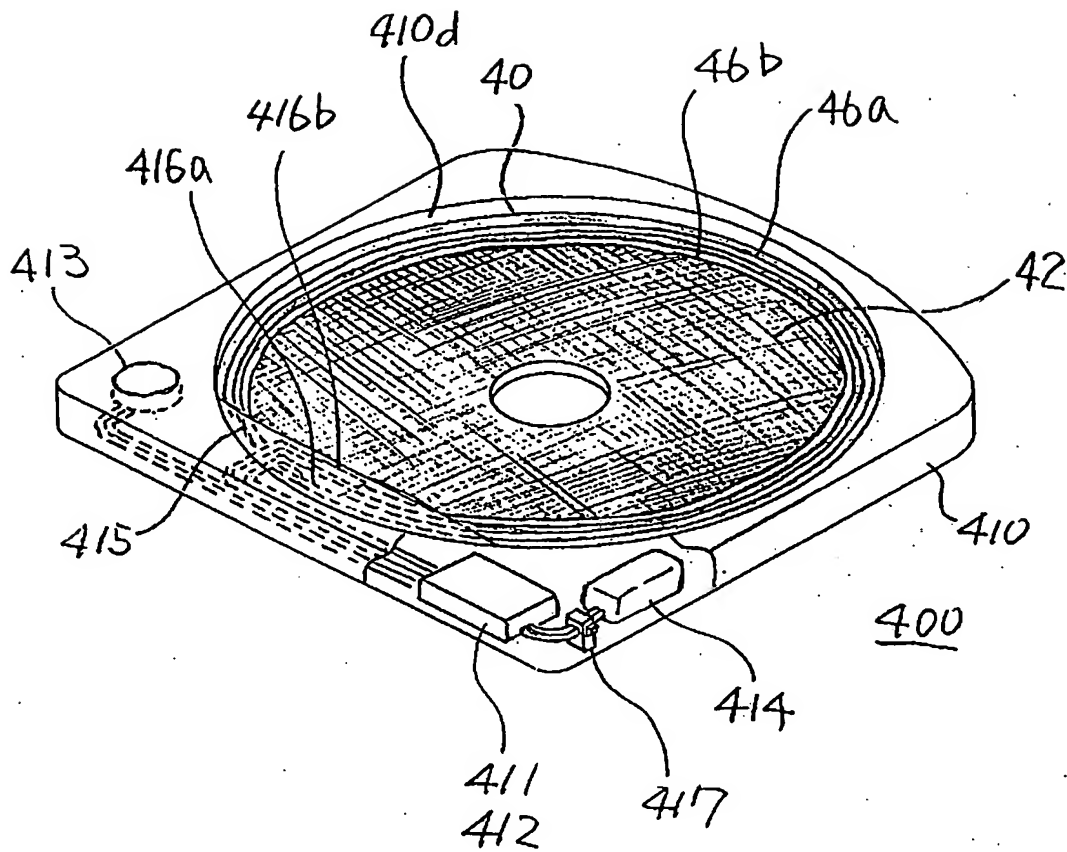
[Fig. 6]



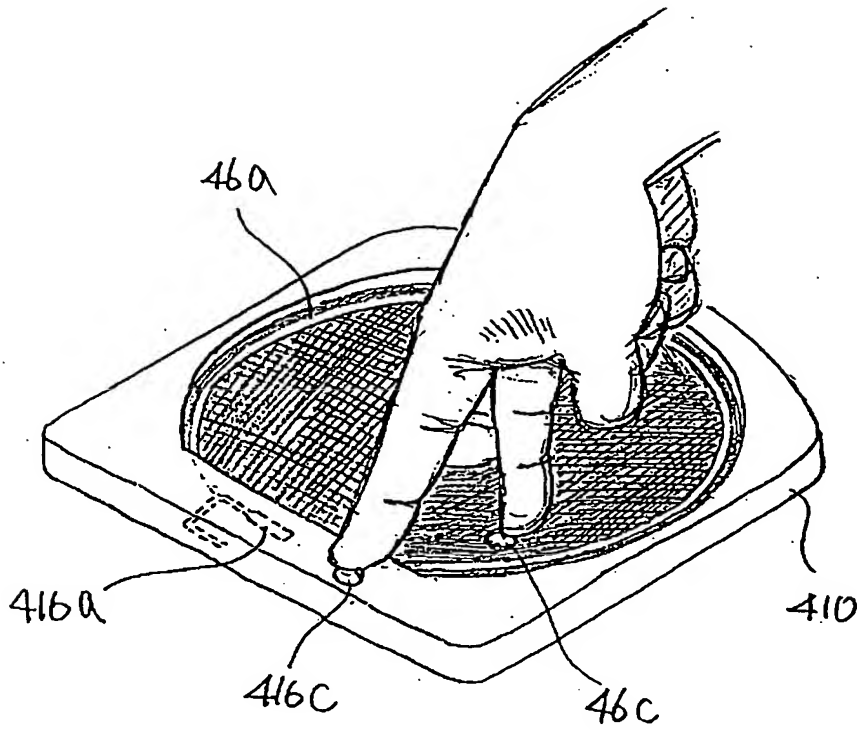
[Fig.7]



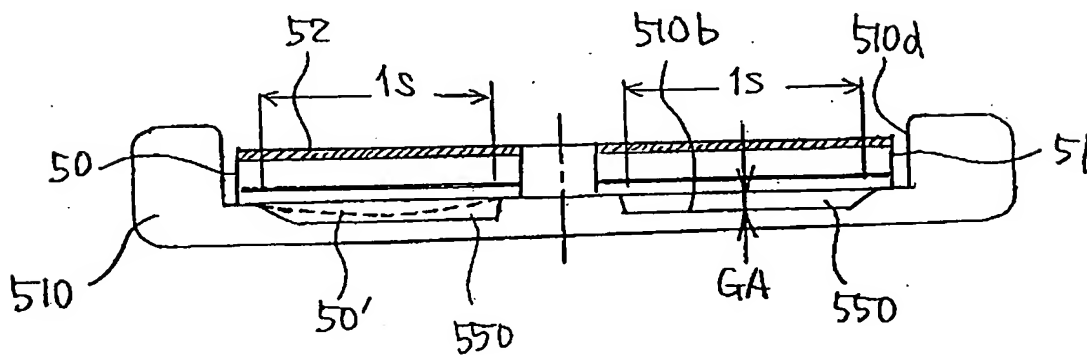
[Fig. 8]



[Fig. 9]



[Fig.10]



[Name of the Document] ABSTRACT

[Abstract]

[Problem] Has an object of providing new visual and tactual effects and convenience in use in a cartridge exposing a label-side surface of a disc.

[Means for Solving the Problem] A planar display section is provided on a label-side surface of a disc, and a memory for an image to be displayed and a power supply are provided on a cartridge body. By rotating the disc, the display is turned on or off.

[Selected Figure] FIG. 7